Cooling Required to Stabilize the Laminar Boundary Layer on a Flat Plate, E. R. Van Driest 698
The Effect of Prandtl Number on the Theoretical Shock-Wave Thickness, Paul A. Libby 286
The Effect of Surface Cooling on Laminar Boundary-Layer Stability, Martin Bloom 635
Effects of Density Fluctuations on the Turbulent Skin Friction of an Insulated Flat Plate at High Supersonic Speeds, T. Y. Li and H. T. Nagamatsu 696
The Energy Equation for Two Kinds of Incompressible Flow, S. Corrsin and L. S. G. Kovasznay 843
Equivalence of the Spanwise Lift Distribution to the Spanwise Lift-Influence Function for Slender Wings and Wing Bodies, G. K. Morikawa and A. E. Puckett 503
The Flow Around a Rotating Disc in a Uniform Stream, H. Schlichting and E. Truckenbrodt 639
Heat Transfer by Laminar Flow from a Rotating Plate, Knox Millsaps and Karl Pohlhausen 354
The Influence of the Temperature Variation of the Specific Heats of Air in Shock-Wave Calculations, J. Kestin 351
An Integral Relation from the Turbulent Energy Equation, Stanley Corrsin 773
A Limitation on Shock Position, E. W. Graham 702
Local Compressible Pressure Coefficient, V. G. Szebehely 772
New Compressibility Correction for Two-Dimensional Subsonic Flow, E. V. Laitone 350
Note on "Heat Transfer by Laminar Flow from a Rotating Plate," Arthur N. Tifford 567
Note on the Minimum Critical Reynolds Number and the Form Parameter, John C. Freeman, Jr. 350
Note on the Relation of Lifting-Line Theory to Lifting-Surface Theory, Eric Reissner 212
Note on Sphere Drag Data, Frederick S. Sherman 566
On Broszko's Theory of Turbulent Flow, William Squire 502
On the Calculation of the Rate of Heat Transfer Through a Laminar Boundary Layer, Arthur N. Tifford and John Wolansky 427
On the Equations of Longitudinal Stability—II, John W. Miles 212
On the Flow of Viscous Incompressible Fluids in Prismatic Ducts, Martin Lessen 844
On the Nonexistence of Subsonic Conical Flows, Theodore R. Goodman 427
On Slender Wing Theory, John W. Miles 770
On the Solution of Total Differential, Boundary Value Problems, Arthur N. Tifford 65
On Subsonic Conical Methods, Seymour Lampert 697
On Supersonic Wing-Body Center of Pressure, G. K. Morikawa and T. F. Coleman 140
On the Theory of Heat Transfer Through a Laminar Boundary Layer, Arthur N. Tifford 283
On the Unsteady Motion of a Thin Rectangular Wing in Supersonic Flow, N. Rott 775
On the Velocity of Sound in Fluids, C. Truesdell 501
Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones, Antonio Ferri 771
Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones, Milton D. Van Dyke, George B. W. Young, and Charles Siska 355
Reflection of Strong Shock at Nearly Glancing Incidence, Donald R. White 633
Remarks on "The Decay of Isotropic Temperature Fluctuations in an Isotropic Turbulence," M. Z. E. Krzywoblocki 843
Ring Shape Source Distribution in Axially Symmetrical Supersonic Flow, S. I. Pai 634
Secondary Flow in Cascades, J. M. Stephenson 699
A Simple Graphical Solution of the Duhamel Integral, E. V. Laitone and J. T. Ahlin 142
A Simple Rule for the Velocity Rise with Subsonic Mach Number on Ellipsoids of Revolution, D. Küchemann 770
Simplified Compressible Laminar Boundary-Layer Theory, Arthur N. Tifford 358
The Source-Flow in Supersonic and Incompressible Theories, H. Serbin 431
Strength of Reflected Shock in Mach Reflections, H. S. Tan 768
Thickness of a Steady Shock Wave, J. J. Bernard 210
Turbulent Diffusion from a Source in Turbulent Shear Flow, J. O. Hinze 565
Use of the Local Mach Numbers in the Prandtl-Glauert Method, E. V. Laitone 842
Remarks on Low-Aspect-Ratio Configurations in Supersonic Flow, P. A. Lagerstrom and M. E. Graham 91
The Rolling Up of the Trailing Vortex Sheet and Its Effect on the Downwash Behind Wings, John R. Spreiter and Alvin H. Sacks 21
The Secondary Flow in a Cascade of Airfoils in a Non-uniform Stream, H. B. Squire and K. G. Winter 271
Skin-Friction and Heat-Transfer Characteristics of a Laminar Boundary Layer on a Cylinder in Axial Incompressible Flow, R. A. Seban and R. Bond 671
Sphere Drag Data at Supersonic Speeds and Low Reynolds Numbers, E. D. Kane 259
Supersonic Wing-Body Lift, George Morikawa 217
Three-Dimensional Shock-Wave Reflections, E. Migotsky and M. V. Morkovin 484
Transient Loading of Wide Delta Airfoils at Supersonic Speeds, John W. Miles 543
The Turbulent Boundary Layer in a Compressible Fluid with Positive Pressure Gradient, Carlo Ferrari 460
Turbulent Boundary Layer in Compressible Fluids, E. R. Van Driest 145
Wind-Tunnel Tests for Temperature Recovery Factors at Supersonic Velocities, W. F. Hilton 97

Aeroelasticity—

Aerodynamic Coefficients of an Oscillating Airfoil in Two-Dimensional Subsonic Flow, R. Timman, A. I. van de Vooren, and J. H. Greidanus 797
Coupled Free Vibrations of a Swept Wing, A. E. Engelbrecht 329
Dynamic Analysis of Aeroelastic Aircraft by the Transfer Function-Fourier Method, James B. Rea 375
Gust Loads on Rigid Airplanes with Pitching Neglected, R. L. Bisplinghoff, G. Isakson, and T. F. O'Brien 33
Nonlinear Effects of Structural Deformation on Stability, Albert Epstein 50
Nonstationary Motion of Purely Supersonic Wings, Jack E. Froehlich 298
On the Deflection of Swept Cantilevered Surfaces, Harold C. Martin and Hemen J. Gursahaney 805
Readers' Forum
Analytical and Experimental Studies on Dynamic Loads in Airplane Structures During Landing (Erratum), T. H. H. Pian 640
Comment on "Vibration of Rectangular Plates," and Author's Reply, Charles Massonnet 703
Concerning a Definite Integral, Yudell L. Luke and Dolores Ufford 429
Discussion on "The Solution of Elastic Problems by Electronic Analog Computation," R. H. MacNeal, G. D. McCann, and C. H. Wilts 71
Generalized Complex Forces in Flutter Calculations, J. E. V. Nilsson and N. B. Langefors 139
Vibrations of Rectangular Plates, Harold Lurie 139

The Solution of Aeroelastic Problems by Means of Electrical Analogies, R. H. MacNeal, G. D. McCann, and C. H. Wilts 777
Structural Load Measurements on Complex Aircraft Components Using Strain-Gage Summation Circuits, Maurice A. Walter 101
A Superposition Method for Calculating the Aeroelastic Behavior of Swept Wings, R. B. Brown, K. F. Holtby, and H. C. Martin 531
Tables of the Theodorsen Circulation Function for Generalized Motion, Yudell L. Luke and Max A. Dengler 478
AHLIN, J. T., AND E. V. LAITONE. A Simple Graphical Solution of the Duhamel Integral (Readers' Forum) 142
Airfoils, negative camber, for transonic flight 361
Airfoil, oscillating, in two-dimensional subsonic flow, aerodynamic coefficients of 797
Airfoils in a nonuniform stream, the secondary flow in a cascade of 271
Airfoils, wide delta, at supersonic speeds, transient loading of 543
ASHKENAS, HARRY I., AND ARTHUR E. BRYSON. Design and performance of a Simple Interferometer for Wind-Tunnel Measurements 82
Automatic Control—
Aerodynamic Stability and Automatic Control, Fourteenth Wright Brothers Lecture, William Bollay 569
Analysis of a Friction Damper for Clutch-Type Servomechanisms, Herbert K. Weiss 676
Dynamic Analysis of Aeroelastic Aircraft by the Transfer Function-Fourier Method, James B. Rea 375
Gyro Pickoff Indications at Arbitrary Plane Attitudes, Leonard Becker 718
Importance of Extending Nyquist Servomechanism Analysis to Include Transient Response, R. L. Johnson and J. B. Rea 43
Readers' Forum
Note on "Longitudinal Stability of Autopilot-Controlled Aircraft," G. J. Sissingh 65
A Simple Graphical Method for Constructing Families of Nyquist Diagrams, Robert M. Stewart 767

BARRY, F. W., A. H. SHAPIRO, AND E. P. NEUMANN. The Interaction of Shock Waves with Boundary Layers on a Flat Surface 229
BEANE, BEVERLY. The Characteristics of Supersonic Wings Having Biconvex Sections 7
BECKER, LEONARD. Gyro Pickoff Indications at Arbitrary Plane Attitudes 718
Bending of thick sandwich plates, note on 424
BERNARD, J. J. Thickness of a Steady Shock Wave (Readers' Forum) 210
BIJLAARD, P. P. Analysis of the Elastic and Plastic Stability of Sandwich Plates by the Method of Split Rigidities —I and II 339, 790
BISPLINGHOFF, R. L., G. ISAKSON, AND T. F. O'BRIEN. Gust Loads on Rigid Airplanes with Pitching Neglected. 33
———, AND A. L. LANG. Some Results of Sweptback Wing Structural Studies 705
Blade bending, rotor, dynamic effects in 813
Blade, rotating, the laminar boundary layer on 247
Blades, rotating, free and forced vibrations of 278
BLEVISS, ZEGMUND O. Some Roll Characteristics of Cruciform Delta Wings at Supersonic Speeds 289
BLOOM, MARTIN. The Effect of Surface Cooling on Laminar Boundary-Layer Stability (Readers' Forum) 635
BOGDONOFF, SEYMOUR M. The Performance of Axial-Flow Compressors as Affected by Single-Stage Characteristics 319
BOLEY, BRUNO A., AND ROLAND H. MOORE. The Calculation of Deflections of Indeterminate Structures (Readers' Forum) 285
BOLLAY, WILLIAM. Aerodynamic Stability and Automatic Control, Fourteenth Wright Brothers Lecture 569
BOND, R., AND R. A. SEBAN. Skin-Friction and Heat-Transfer Characteristics of a Laminar Boundary Layer on a Cylinder in Axial Incompressible Flow 671
Boundary layer and base pressure, interrelationship between 743
Boundary layer, laminar, on a cylinder in axial incompressible flow, skin-friction and heat-transfer characteristics of 671
Boundary layer, laminar, on a rotating blade 247
Boundary layer, the laminar-turbulent transition in 490
Boundary layer, turbulent, in supersonic flow, along a flat plate, comparison of theoretical and experimental results for 555
Boundary layer, turbulent, in a compressible fluid with positive pressure gradient 460
Boundary layer, turbulent, in compressible fluids 145
Boundary layers on a flat surface, the interaction of shock waves with 229
Boundary layers, laminar, in compressible fluids, effects of pressure gradient on stability and skin friction in 311
BOUTON, INNES. Airplane Pitching Moment of Inertia (Readers' Forum) 140
BOWER, R. E. An Approximate Treatment of Multishock Bodies of Revolution at Small Angles of Attack by the Method of Characteristics (Readers' Forum) 70
BRADFIELD, W. S., AND G. E. YALE. Small Pitot Tubes with Fast Pressure Response Time (Readers' Forum) 697
BROWN, R. B., K. F. HOLTBY, AND H. C. MARTIN. A Superposition Method for Calculating the Aeroelastic Behavior of Swept Wings 531
BRYSON, ARTHUR E., AND HARRY I. ASHKENAS. Design and Performance of a Simple Interferometer for Wind-Tunnel Measurements 82
Buckling load of a stepped column 124
Buckling of sandwich cylinders under axial compression 398
BURKE, EDWARD, AND RAYMOND FRIEDMAN. On the One-Dimensional Theory of Flame Structure 239

CHANG, CHIEH-CHIEN, AND BERTRAND DES CLERS. On Some Special Problems in Linearized Axially Symmetric Flow 127
CICALA, P. On Plastic Buckling of Plates and a Theory of Plastic Slip (Readers' Forum) 285
COLEMAN, T. F., AND G. K. MORIKAWA. On Supersonic Wing-Body Center of Pressure (Readers' Forum) 140
Column, stepped, buckling load of a 124
Compressive stresses, allowable, in aircraft structures 657
Compressors, axial, simplified design comparisons of 447
CORRSIN, STANLEY. The Decay of Isotropic Temperature Fluctuations in an Isotropic Turbulence 417
——— An Integral Relation from the Turbulent Energy Equation (Readers' Forum) 773
———, AND L. S. G. KOVASZNAY. The Energy Equation for Two Kinds of Incompressible Flow (Readers' Forum) 843
CRAMER, R. H. Interference Between Wing and Body at Supersonic Speeds—Theoretical and Experimental Determination of Pressures on the Body 629

DECKER, JAMES L. Horizontal Tail Loads in Abrupt Pull-Ups from Level Flight 835

DENGLER, MAX A., AND YUDELL L. LUKE. Tables of the Theodorsen Circulation Function for Generalized Motion. 478

DES CLERS, BERTRAND, AND CHIEH-CHIEN CHANG. On Some Special Problems in Linearized Axially Symmetric Flow. 127

DHAWAN, SATISH, AND ANATOL ROSHKO. A Flexible Nozzle for a Small Supersonic Wind Tunnel. 253

DIENEMANN, W. Calculation of the Thermal Boundary Layer of a Body in Incompressible Laminar Flow (Readers' Forum). 64

DORRANCE, WILLIAM H. Nonsteady Supersonic Flow About Pointed Bodies of Revolution. 505

Downwash behind wings, the rolling up of the trailing vortex sheet and its effect on the. 21

DURHAM, FRANKLIN P. The Effect of Flight and Configuration Variables on Thermal Stresses in Diamond-Shaped Supersonic Wings. 755

EHRET, DORRIS M., AND STANFORD E. NEICE. Similarity Laws for Slender Bodies of Revolution in Hypersonic Flows. 527

EISENHARDT, GEORGE H. AND WARREN M. ROHSENOW. Calculation of Thermal Stresses in a Wedge-Shaped Wing 115

EMMONS, H. W. The Laminar-Turbulent Transition in a Boundary Layer—Part I. 490

ENGELBRECHT, A. E. Coupled Free Vibrations of a Swept Wing. 329

EPSTEIN, ALBERT. Nonlinear Effects of Structural Deformation on Stability. 50

FERRARI, CARLO. Comparison of Theoretical and Experimental Results for the Turbulent Boundary Layer in Supersonic Flow Along a Flat Plate. 555

——— The Turbulent Boundary Layer in a Compressible Fluid with Positive Pressure Gradient. 460

FERRI, ANTONIO. Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones (Readers' Forum). 771

Flame-front stability, experimental and theoretical studies of. 199

Flame structure, on the one-dimensional theory of. 239

FLAX, A. H., AND L. GOLAND. Dynamic Effects in Rotor Blade Bending. 813

Flight Propulsion—

Approximate Solutions for Shock Waves in a Steady, One-Dimensional, Viscous and Compressible Gas, Paul Lieber, Frank Romano, and Henry Lew. 55

Determination of Rocket-Motor Heat-Transfer Coefficients by the Transient Method, Stanley Greenfield. 512

The Effect of Changes in Altitude on the Controlled Behavior of a Gas-Turbine Engine, Seymour C. Himmel and Richard P. Krebs. 433

Experimental and Theoretical Studies of Flame-Front Stability, George H. Markstein. 199

Free and Forced Vibrations of Rotating Blades, Robert Plunkett. 278

The Interaction of Shock Waves with Boundary Layers on a Flat Surface, F. W. Barry, A. H. Shapiro, and E. P. Neumann. 229

On the One-Dimensional Theory of Flame Structure, Raymond Friedman and Edward Burke. 239

The Performance of Axial-Flow Compressors as Affected by Single-Stage Characteristics, Seymour M. Bogdonoff. 319

Readers' Forum

Interaction of Flow Pulsations and Flame Propagation, G. H. Markstein. 428

On the Calculation of the Potential Flow Around Airfoils in Cascade, N. Scholz. 68

On an Extension of Glauert's Theory of Thin Airfoils to Profiles in Cascade, N. Scholz. 637

A Possible Relation Between Cellular Flame Structure and Quenching, Raymond Friedman. 499

Simplified Design Comparisons of Axial Compressors, Frank L. Wattendorf. 447

Flow of gas, two-dimensional laminar jet, on the stability of. 731

Fluid, compressible, viscous, heat-conducting, the classification of one-dimensional flows and the general shock problem of. 830

FOGARTY, LAURENCE EUGENE. The Laminar Boundary Layer on a Rotating Blade. 247

FREEMAN, JOHN C., JR. Note on the Minimum Critical Reynolds Number and the Form Parameter (Readers' Forum). 350

FRIEDMAN, RAYMOND. A Possible Relation Between Cellular Flame Structure and Quenching (Readers' Forum). 499

———, AND EDWARD BURKE. On the One-Dimensional Theory of Flame Structure. 239

FROEHLICH, JACK E. Nonstationary Motion of Purely Supersonic Wings. 298

FUSFELD, ROBERT D. A Probe for Measuring Flow Inclination in a Supersonic Air Stream (Readers' Forum). 356

GATEWOOD, B. E., AND E. L. WILLIAMS. Allowable Compressive Stresses in Aircraft Structures. 657

GAYHART, E. L., AND ROCHELLE PRESCOTT. A Method of Correction of Astigmatism in Schlieren Systems (Readers' Forum). 69

GERARD, GEORGE. Note on Bending of Thick Sandwich Plates. 424

———, F. K. TEICHMANN, AND CHI-TEH WANG. Buckling of Sandwich Cylinders Under Axial Compression. 398

GIEDT, W. H. Effect of Turbulence Level of Incident Air Stream on Local Heat Transfer and Skin Friction on a Cylinder. 725

GOLAND, L., AND A. H. FLAX. Dynamic Effects in Rotor Blade Bending. 813

GOODIER, J. N., AND I. M. NEOU. The Evaluation of Theoretical Critical Compression in Sandwich Plates. 649

GOODMAN, THEODORE R. Aerodynamics of a Supersonic Rectangular Wing Striking a Sharp-Edged Gust. 519

——— On the Nonexistence of Subsonic Conical Flows (Readers' Forum). 427

GORAN, L. A. A Minimum Energy Solution and an Electrical Analogy for the Stress Distribution in Stiffened Shells. 407

GRAHAM, E. W. A Limitation on Shock Position (Readers' Forum). 702

——— A Limiting Case for Missile Rolling Moments. 624

GRAHAM, MARTHA E., AND P. A. LAGERSTROM. Methods for Calculating the Flow in the Trefftz-Plane Behind Supersonic Wings. 179

——— Remarks on Low-Aspect-Ratio Configurations in Supersonic Flow. 91

GREENFIELD, STANLEY. Determination of Rocket-Motor Heat-Transfer Coefficients by the Transient Method. 512

GREIDANUS, J. H., R. TIMMAN, AND A. I. VAN DE VOOREN. Aerodynamic Coefficients of an Oscillating Airfoil in Two-Dimensional Subsonic Flow. 797

GURSAHANEY, HEMEN J., AND HAROLD C. MARTIN. On the Deflection of Swept Cantilevered Surfaces. 805

Gust loads on rigid airplanes with pitching neglected. 33

Gust, sharp-edged, aerodynamics of a supersonic rectangular wing striking 519

HANDELMAN, G. H. Shear Center for Thin-Walled Open Sections Beyond the Elastic Limit 749
HERTZBERG, ABRAHAM. A Shock Tube Method of Generating Hypersonic Flows 803
HILTON, W. F. Wind-Tunnel Tests for Temperature Recovery Factors at Supersonic Velocities 97
HIMMEL, SEYMOUR C., AND RICHARD P. KREBS. The Effect of Changes in Altitude on the Controlled Behavior of a Gas-Turbine Engine 433
HINZE, J. O. Turbulent Diffusion from a Source in Turbulent Shear Flow (Readers' Forum) 565
HISLOP, G. S. Comments on "The Laminar-Turbulent Transition in a Boundary Layer" (Readers' Forum) ... 845
HOBLIT, FREDERIC M. Buckling Load of a Stepped Column 124
HOLTBY, K. F., R. B. BROWN, AND H. C. MARTIN. A Superposition Method for Calculating the Aeroelastic Behavior of Swept Wings 531
Hyperballistics wind tunnel, N.O.L., summary of recent experimental investigations in 665
Hypersonic flows, a shock tube method of generating 803
Hypersonic flows, similarity laws for slender bodies of revolution in 527

Instruments—
Design and Performance of a Simple Interferometer for Wind-Tunnel Measurements, Harry I. Ashkenas and Arthur E. Bryson 82
Readers' Forum
A Probe for Measuring Flow Inclination in a Supersonic Air Stream, Robert D. Fusfeld 356
Small Pitot Tubes with Fast Pressure Response Time, W. S. Bradfield and G. E. Yale 697
Structural Load Measurements on Complex Aircraft Components Using Strain-Gage Summation Circuits, Maurice A. Walter 101
Interferometer, simple, for wind-tunnel measurements, design and performance of 82
ISAKSON, G., R. L. BISPLINGHOFF, AND T. F. O'BRIEN. Gust Loads on Rigid Airplanes with Pitching Neglected. 33

JOHNSON, R. L., AND J. B. REA. Importance of Extending Nyquist Servomechanism Analysis to Include Transient Response 43
JONES, ROBERT T. The Minimum Drag of Thin Wings in Frictionless Flow 75

KANE, E. D. Sphere Drag Data at Supersonic Speeds and Low Reynolds Numbers 259
KESTIN, J. The Influence of the Temperature Variation of the Specific Heats of Air in Shock-Wave Calculations (Readers' Forum) 351
KOVASZNAY, L. S. G., AND S. CORRSIN. The Energy Equation for Two Kinds of Incompressible Flow (Readers' Forum) 843
KREBS, RICHARD P., AND SEYMOUR C. HIMMEL. The Effect of Changes in Altitude on the Controlled Behavior of a Gas-Turbine Engine 433
KRZYWOBLOCKI, M. Z. E. Remarks on "The Decay of Isotropic Temperature Fluctuations in an Isotropic Turbulence" (Readers' Forum) 843
KÜCHEMANN, D. A Simple Rule for the Velocity Rise with Subsonic Mach Number on Ellipsoids of Revolution (Readers' Forum) 770
KUO, YUNG-HUAI. On the Stability of Two-Dimensional Smooth Transonic Flows 1
KURZWEG, H. H. Interrelationship Between Boundary Layer and Base Pressure 743

LAGERSTROM, P. A., AND MARTHA E. GRAHAM. Methods for Calculating the Flow in the Trefftz-Plane Behind Supersonic Wings 179
——— Remarks on Low-Aspect-Ratio Configurations in Supersonic Flow 91
LAITONE, E. V. Concerning Hadamard's Solution for a Source in Supersonic Flow (Readers' Forum) 775
——— New Compressibility Correction for Two-Dimensional Subsonic Flow (Readers' Forum) 350
——— Use of the Local Mach Number in the Prandtl-Glauert Method (Readers' Forum) 842
———, AND J. T. AHLIN. A Simple Graphical Solution of the Duhamel Integral (Readers' Forum). 142
———, AND E. R. WALTERS. The Application of Nonstationary Airfoil Theory to Dynamic Stability Calculations (Readers' Forum) 214
LAMPERT, SEYMOUR. Conical Flow Methods Applied to Uniformly Loaded Wings in Subsonic Flow 107
——— On Subsonic Conical Methods (Readers' Forum) 697
LANG, A. L., AND R. L. BISPLINGHOFF. Some Results of Sweptback Wing Structural Studies 705
LANGEFORS, N. B., AND J. E. V. NILSSON. Generalized Complex Forces in Flutter Calculations (Readers' Forum) 139
LAWRENCE, H. R. The Lift Distribution on Low Aspect Ratio Wings at Subsonic Speeds 683
LEES, LESTER. Comments on the "Effect of Surface Cooling on Laminar Boundary-Layer Stability" (Readers' Forum) 844
———. Note on the Hypersonic Similarity Law for an Unyawed Cone (Readers' Forum) 700
LESSEN, MARTIN. On the Flow of Viscous Incompressible Fluids in Prismatic Ducts (Readers' Forum) 844
LEW, HENRY, PAUL LIEBER, AND FRANK ROMANO. Approximate Solutions for Shock Waves in a Steady, One-Dimensional, Viscous and Compressible Gas 55
LI, TING-YI. Purely Rolling Oscillations of a Rectangular Wing in Supersonic Flow 191
———, AND H. T. NAGAMATSU. Effects of Density Fluctuations on the Turbulent Skin Friction of an Insulated Flat Plate at High Supersonic Speeds (Readers' Forum) 696
LIBBY, PAUL A. The Effect of Prandtl Number on the Theoretical Shock-Wave Thickness (Readers' Forum) ... 286
LIEBER, PAUL, FRANK ROMANO, AND HENRY LEW. Approximate Solutions for Shock Waves in a Steady, One-Dimensional, Viscous and Compressible Gas 55
LUDFORD, GEOFFREY S. S. The Classification of One-Dimensional Flows and the General Shock Problem of a Compressible, Viscous, Heat-Conducting Fluid 830
LUDLOFF, H. F., AND L. TING. Aerodynamics of Blasts (Readers' Forum) 143
LUKE, YUDELL L., AND MAX A. DENGLER. Tables of the Theodorsen Circulation Function for Generalized Motion. 478
———, AND DOLORES UFFORD. Concerning a Definite Integral (Readers' Forum) 429
LURIE, HAROLD. Author's Reply (Readers' Forum) 703

——————— Effective End Restraint of Columns by Frequency Measurements (Readers' Forum) 566
——————— Vibrations of Rectangular Plates (Readers' Forum) 139
LUSTWERK, F., AND E. P. NEUMANN. High-Efficiency Supersonic Diffusers 369

MACNEAL, R. H., G. D. MCCANN, AND C. H. WILTS. Discussion on "The Solution of Elastic Problems by Electronic Analog Computation" (Readers' Forum) 71
——————— The Solution of Aeroelastic Problems by Means of Electrical Analogies 777
MARKSTEIN, GEORGE H. Experimental and Theoretical Studies of Flame-Front Stability 199
——————— Interaction of Flow Pulsations and Flame Propagation (Readers' Forum) 428
MARTIN, H. C., R. B. BROWN, AND K. F. HOLTBY. A Superposition Method for Calculating the Aeroelastic Behavior of Swept Wings 531
———————, AND HEMEN J. GURSAHANEY. On the Deflection of Swept Cantilevered Surfaces 805
MASSONNET, CHARLES. Comment on "Vibration of Rectangular Plates" (Readers' Forum) 703
MCCANN, G. D., R. H. MACNEAL, AND C. H. WILTS. Discussion on "The Solution of Elastic Problems by Electronic Analog Computation" (Readers' Forum) 71
——————— The Solution of Aeroelastic Problems by Means of Electrical Analogies 777
MCLELLAN, CHARLES H. Exploratory Wind-Tunnel Investigation of Wings and Bodies at $M = 6.9$ 641
MERRIAM, K. G. A Note on Wind-Tunnel Wall Effect Corrections for Rectangular Airfoils (Readers' Forum) 845
MICHIELSEN, H. F. Calculation of Deflections in Indeterminate Structures (Readers' Forum) 284
MIGOTSKY, E., AND M. V. MORKOVIN. Three-Dimensional Shock-Wave Reflections 484
MILES, JOHN W. On the Equations of Longitudinal Stability—II (Readers' Forum) 212
——————— On Slender Wing Theory (Readers' Forum) 770
——————— Transient Loading of Wide Delta Airfoils at Supersonic Speeds 543
MILLSAPS, KNOX, AND KARL POHLHAUSEN. Heat Transfer by Laminar Flow from a Rotating Plate (Readers' Forum) 354
Missiles—
Exploratory Wind-Tunnel Investigation of Wings and Bodies at $M = 6.9$, Charles H. McLellan 641
Interrelationship Between Boundary Layer and Base Pressure, H. H. Kurzweg 743
A Limiting Case for Missile Rolling Moments, Ernest W. Graham 624
Readers' Forum
Astroballistic Heat Transfer, R. N. Thomas and F. L. Whipple 636
Note on the Hypersonic Similarity Law for an Unyawed Cone, Lester Lees 700
Remarks on Low-Aspect-Ratio Configurations in Supersonic Flow, P. A. Lagerstrom and M. E. Graham 91
Similarity Laws for Slender Bodies of Revolution in Hypersonic Flows, Stanford E. Neice and Dorris M. Ehret 527
Some Roll Characteristics of Cruciform Delta Wings at Supersonic Speeds, Zegmund O. Bleviss 289
Summary of Recent Experimental Investigations in the N.O.L. Hyperballistics Wind Tunnel, Peter P. Wegener 665
MOORE, ROLAND H., AND BRUNO A. BOLEY. The Calculation of Deflections of Indeterminate Structures (Readers' Forum) 285
MORDUCHOW, M., AND M. MORKOVIN. Concluding Remarks on the Speed of Sound (Readers' Forum) 66
MORGAN, A. J. A. Uniformly Loaded Semi-Infinite Wedge-Shaped Plates (Readers' Forum) 845
MORIKAWA, GEORGE. Supersonic Wing-Body Lift 217
———————, AND T. F. COLEMAN. On Supersonic Wing-Body Center of Pressure (Readers' Forum) 140
———————, AND A. E. PUCKETT. Equivalence of the Spanwise Lift Distribution to the Spanwise Lift-Influence Function for Slender Wings and Wing Bodies (Readers' Forum) 503
MORKOVIN, M. V., AND E. MIGOTSKY. Three-Dimensional Shock-Wave Reflections 484
———————, AND M. MORDUCHOW. Concluding Remarks on the Speed of Sound 66
MUNK, MAX M. On Turbulent Fluid Motion 442
MURPHY, JAMES S., AND RALPH E. PHINNEY. Visualization of Boundary-Layer Flow (Readers' Forum) 771

NAGAMATSU, H. T., AND T. Y. LI. Effects of Density Fluctuations on the Turbulent Skin Friction of an Insulated Flat Plate at High Supersonic Speeds (Readers' Forum) 696
NEICE, STANFORD E., AND DORRIS M. EHRET. Similarity Laws for Slender Bodies of Revolution in Hypersonic Flows 527
NEOU, I. M., AND J. N. GOODIER. The Evaluation of Theoretical Critical Compression in Sandwich Plates 649
NEUMANN, E. P., F. W. BARRY, AND A. H. SHAPIRO. The Interaction of Shock Waves with Boundary Layers on a Flat Surface 229
———————, AND F. LUSTWERK. High-Efficiency Supersonic Diffusers 369
NILES, ALFRED S. Formulas for Bending with Axial Tension (Readers' Forum) 356
NILSSON, J. E. V., AND N. B. LANGEFORS. Generalized Complex Forces in Flutter Calculations (Readers' Forum) 139
Nozzle, flexible, for a small supersonic wind tunnel 253

O'BRIEN, T. F., R. L. BISPLINGHOFF, AND G. ISAKSON. Gust Loads on Rigid Airplanes with Pitching Neglected 33

PAI, S. I. Ring Shape Source Distribution in Axially Symmetrical Supersonic Flow (Readers' Forum) 634
——————— On the Stability of Two-Dimensional Laminar Jet Flow of Gas 731
PHINNEY, RALPH E., AND JAMES S. MURPHY. Visualization of Boundary-Layer Flow (Readers' Forum) 771
PIAN, T. H. H. Analytical and Experimental Studies on Dynamic Loads in Airplane Structures During Landing (Erratum) 640
PIERSON, JOHN D. On the Virtual Mass of Water Associated with an Immersing Wedge (Readers' Forum) 430
PLUNKETT, ROBERT. Free and Forced Vibrations of Rotating Blades 278
POHLHAUSEN, KARL, AND KNOX MILLSAPS. Heat Transfer by Laminar Flow from a Rotating Plate (Readers' Forum) 354
POTTER, J. LEITH. Base Pressures at Supersonic Speeds (Readers' Forum) 141
PRESCOTT, ROCHELLE, AND E. L. GAYHART. A Method of Correction of Astigmatism in Schlieren Systems (Readers' Forum) 69

PRIDE, RICHARD A., AND ELBRIDGE Z. STOWELL. The Effect of Compressibility of the Material on Plastic Buckling Stresses (Readers' Forum) ... 773
PUCKETT, A. E., AND G. K. MORIKAWA. Equivalence of the Spanwise Lift Distribution to the Spanwise Lift-Influence Function for Slender Wings and Wing Bodies (Readers' Forum) ... 503

RAND, THORKILD. An Approximate Method for the Calculation of the Stresses in Sweptback Wings ... 61
RAO, G. V. R. Buckling of a Pretwisted Pin-Ended Column (Readers' Forum) ... 211
REA, JAMES B. Dynamic Analysis of Aeroelastic Aircraft by the Transfer Function-Fourier Method ... 375
———, AND R. L. JOHNSON. Importance of Extending Nyquist Servomechanism Analysis to Include Transient Response ... 43
REISSNER, ERIC. Note on the Relation of Lifting-Line Theory to Lifting-Surface Theory (Readers' Forum) ... 212
Rocket-motor heat-transfer coefficients by the transient method, determination of ... 512
ROHSENOW, WARREN M., AND GEORGE H. EISENHARDT. Calculation of Thermal Stresses in a Wedge-Shaped Wing 115
ROMANO, FRANK, PAUL LIEBER, AND HENRY LEW. Approximate Solutions for Shock Waves in a Steady, One-Dimensional, Viscous and Compressible Gas ... 55
ROSHKO, ANATOL, AND SATISH DHAWAN. A Flexible Nozzle for a Small Supersonic Wind Tunnel ... 253
Rotating Wing Aircraft—
Dynamic Effects in Rotor Blade Bending. A. H. Flax and L. Goland ... 813
Readers' Forum
Comments on "A Type of Lifting Rotor with Inherent Stability," G. J. Sissingh ... 210
ROTT, N. On the Unsteady Motion of a Thin Rectangular Wing in Supersonic Flow (Readers' Forum) ... 775

SACKS, ALVIN H., AND JOHN R. SPREITER. The Rolling Up of the Trailing Vortex Sheet and Its Effect on the Downwash Behind Wings ... 21
Sandwich cylinders under axial compression, buckling of ... 398
Sandwich plates by the method of split rigidities, analysis of the elastic and plastic stability of—I and II ... 339, 790
Sandwich plates, evaluation of theoretical critical compression in ... 649
Sandwich plates, thick, note on bending of ... 424
SAUER, F. M. Convective Heat Transfer from Spheres in a Free-Molecule Flow (Readers' Forum) ... 353
SCHLICHTING, H., AND E. TRUCKENBRODT. The Flow Around a Rotating Disc in a Uniform Stream (Readers' Forum) ... 639
SCHOLZ, N. On the Calculation of the Potential Flow Around Airfoils in Cascade (Readers' Forum) ... 68
———— On an Extension of Glauert's Theory of Thin Airfoils to Profiles in Cascade (Readers' Forum) ... 637
Seaplanes and Flying Boats—
Readers' Forum
On the Virtual Mass of Water Associated with an Immersing Wedge, John D. Pierson ... 430
SEBAN, R. A., AND R. BOND. Skin-Friction and Heat-Transfer Characteristics of a Laminar Boundary Layer on a Cylinder in Axial Incompressible Flow ... 671
SERBIN, H. The Source-Flow in Supersonic and Incompressible Theories (Readers' Forum) ... 431
Servomechanism analysis, Nyquist, to include transient response, importance of extending ... 43
Servomechanisms, clutch-type, analysis of a friction damper for ... 676
SHAPIRO, A. H., F. W. BARRY, AND E. P. NEUMANN. The Interaction of Shock Waves with Boundary Layers on a Flat Surface ... 229
Shear center for thin-walled open sections beyond the elastic limit ... 749
Shells, stiffened, minimum energy solution and an electrical analogy for the stress distribution in ... 407
SHERMAN, FREDERICK S. Note on Sphere Drag Data (Readers' Forum) ... 566
Shock-wave reflections, three-dimensional ... 484
Shock waves with boundary layers on a flat surface, the interaction of ... 229
Shock waves in a steady, one-dimensional, viscous and compressible gas, approximate solutions for ... 55
SIBERT, H. W. Shear Flow in a Thin-Skin Tapered Beam (Readers' Forum) ... 703
SISKA, CHARLES, MILTON D. VAN DYKE, AND GEORGE B. W. YOUNG. Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones (Readers' Forum) 355
SISSINGH, G. J. Comments on "A Type of Lifting Rotor with Inherent Stability" (Readers' Forum) ... 210
———— Note on "Longitudinal Stability of Autopilot-Controlled Aircraft" (Readers' Forum) ... 65
Skin friction on a cylinder, effect of turbulence level of incident air stream on local heat transfer and ... 725
SPREITER, JOHN R., AND ALVIN H. SACKS. The Rolling Up of the Trailing Vortex Sheet and Its Effect on the Downwash Behind Wings ... 21
SQUIRE, H. B., AND K. G. WINTER. The Secondary Flow in a Cascade of Airfoils in a Nonuniform Stream ... 271
SQUIRE, WILLIAM. On Broszko's Theory of Turbulent Flow (Readers' Forum) ... 502
Stability, nonlinear effects of structural deformation on ... 50
STEPHENSON, J. M. Secondary Flow in Cascades (Readers' Forum) ... 699
STEWART, ROBERT M. A Simple Graphical Method for Constructing Families of Nyquist Diagrams (Readers' Forum) ... 767
STOWELL, ELBRIDGE Z., AND RICHARD A. PRIDE. The Effect of Compressibility of the Material on Plastic Buckling Stresses (Readers' Forum) ... 773
Stress Analysis and Structures—
Allowable Compressive Stresses in Aircraft Structures, B. E. Gatewood and E. L. Williams ... 657
A Minimum Energy Solution and an Electrical Analogy for the Stress Distribution in Stiffened Shells, L. A. Goran ... 407
Analysis of the Elastic and Plastic Stability of Sandwich Plates by the Method of Split Rigidities—I and II, P. P. Bijlaard ... 339, 790
An Approximate Method for the Calculation of the Stresses in Sweptback Wings, Thorkild Rand ... 61
Buckling Load of a Stepped Column, Frederic M. Hoblit. 124
Buckling of Sandwich Cylinders Under Axial Compression, F. K. Teichmann, Chi-Teh Wang, and George Gerard ... 398
Calculation of Thermal Stresses in a Wedge-Shaped Wing, George H. Eisenhardt and Warren M. Rohsenow ... 115
The Evaluation of Theoretical Critical Compression in Sandwich Plates, J. N. Goodier and I. M. Neou ... 649
Note on Bending of Thick Sandwich Plates, George Gerard ... 424
Readers' Forum
Analytical and Experimental Studies on Dynamic Loads in Airplane Structures During Landing (Erratum), T. H. H. Pian ... 640

Buckling of a Pretwisted Pin-Ended Column, G. V. R. Rao ... 211
The Calculation of Deflections of Indeterminate Structures, Bruno A. Boley and Roland H. Moore ... 285
Calculation of Deflections in Indeterminate Structures, H. F. Michielsen ... 284
Comment on the Calculation of Deflections of Indeterminate Structures, Carlos Thalau ... 567
The Effect of Compressibility of the Material on Plastic Buckling Stresses, Elbridge Z. Stowell and Richard A. Pride ... 773
Effective End Restraint of Columns by Frequency Measurements, Harold Lurie ... 566
Formulas for Bending with Axial Tension, Alfred S. Niles ... 356
Lateral Elastic Instability of Hat-Section Stringers, C. M. Tyler, Jr., and T. J. Walker ... 633
On Plastic Buckling of Plates and a Theory of Plastic Slip, P. Cicala ... 285
Shear Flow in a Thin-Skin Tapered Beam, H. W. Sibert ... 703
Uniformly Loaded Semi-Infinite Wedge-Shaped Plates, A. J. A. Morgan ... 845
Shear Center for Thin-Walled Open Sections Beyond the Elastic Limit, G. H. Handelman ... 749
Some Results of Sweptback Wing Structural Studies, A. L. Lang and R. L. Bisplinghoff ... 705
Structural load measurements on complex aircraft components using strain-gage summation ... 101
Supersonic diffusers, high-efficiency ... 369
Supersonic flow along a flat plate, comparison of theoretical and experimental results for the turbulent boundary layer in ... 555
Supersonic flow, nonsteady, about pointed bodies of revolution ... 505
Supersonic flow past bodies of revolution, first- and second-order theory of ... 161
Supersonic flow, remarks on low-aspect-ratio configurations in ... 91
Supersonic speeds and low Reynolds Numbers, sphere drag data at ... 259
Supersonic speeds, some roll characteristics of cruciform delta wings at ... 289
Supersonic speeds, transient loading of wide delta airfoils at ... 543
Supersonic velocities, wind-tunnel tests for temperature recovery factors at ... 97
Supersonic wing-body lift ... 217
Supersonic wings, having biconvex sections, the characteristics of ... 7
Supersonic wings, methods for calculating the flow in the Trefftz-plane behind ... 179
Supersonic wings, purely, nonstationary motion of ... 298
Swept cantilevered surfaces, on the deflection of ... 805
SZEBEHELY, V. G. Local Compressible Pressure Coefficient (Readers' Forum) ... 772

Tail loads, horizontal, in abrupt pull-ups from level flight ... 835
TAN, H. S. Strength of Reflected Shock in Mach Reflection (Readers' Forum) ... 768
TEICHMANN, F. K., CHI-TEH WANG, AND GEORGE GERARD. Buckling of Sandwich Cylinders Under Axial Compression ... 398
THALAU, CARLOS. Comment on the Calculation of Deflections of Indeterminate Structures (Readers' Forum) ... 567
THOMAS, R. N., AND F. L. WHIPPLE. Astroballistic Heat Transfer (Readers' Forum) ... 636
TIFFORD, ARTHUR N. Note on "Heat Transfer by Laminar Flow from a Rotating Plate" (Readers' Forum) ... 567
——— Simplified Compressible Laminar Boundary-Layer Theory (Readers' Forum) ... 358
——— On the Solution of Total Differential, Boundary Value Problems (Readers' Forum) ... 65
——— On the Theory of Heat Transfer Through a Laminar Boundary Layer (Readers' Forum) ... 283
———, AND JOHN WOLANSKY. On the Calculation of the Rate of Heat Transfer Through a Laminar Boundary Layer (Readers' Forum) ... 427
TIMMAN, R., A. I. VAN DE VOOREN, AND J. H. GREIDANUS. Aerodynamic Coefficients of an Oscillating Airfoil in Two-Dimensional Subsonic Flow ... 797
TING, L., AND H. F. LUDLOFF. Aerodynamics of Blasts (Readers' Forum) ... 143
Transonic flight, negative camber airfoils for ... 361
Transonic flows, two-dimensional smooth, on the stability of ... 1
TRUCKENBRODT, E., AND H. SCHLICHTING. The Flow Around a Rotating Disc in a Uniform Stream (Readers' Forum) ... 639
TRUESDELL, C. The Analogy Between Irrotational Gas Flow and Minimal Surfaces (Readers' Forum) ... 502
——— On the Velocity of Sound in Fluids (Readers' Forum) ... 501
Turbulence, isotropic, the decay of isotropic temperature fluctuations in ... 417
Turbulent fluid motion ... 442
TYLER, C. M., JR., AND T. J. WALKER. Lateral Elastic Instability of Hat-Section Stringers (Readers' Forum) ... 633

UFFORD, DOLORES, AND YUDELL L. LUKE. Concerning a Definite Integral (Readers' Forum) ... 429

VAN DE VOOREN, A. I., R. TIMMAN, AND J. H. GREIDANUS. Aerodynamic Coefficients of an Oscillating Airfoil in Two-Dimensional Subsonic Flow ... 797
VAN DRIEST, E. R. Cooling Required to Stabilize the Laminar Boundary Layer on a Flat Plate (Readers' Forum) ... 698
——— Turbulent Boundary Layer in Compressible Fluids ... 145
VAN DYKE, MILTON D. The Combined Supersonic-Hypersonic Similarity Rule (Readers' Forum) ... 499
——— First- and Second-Order Theory of Supersonic Flow Past Bodies of Revolution ... 161
———, GEORGE B. W. YOUNG, AND CHARLES SISKA. Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones (Readers' Forum) ... 355
Vibrations, free and forced, of rotating blades ... 278

WALKER, T. J., AND C. M. TYLER, JR. Lateral Elastic Instability of Hat-Section Stringers (Readers' Forum) ... 633
WALTER, MAURICE A. Structural Load Measurements on Complex Aircraft Components Using Strain-Gage Summation ... 101
WALTERS, E. R., AND E. V. LAITONE. The Application of Nonstationary Airfoil Theory to Dynamic Stability Calculations (Readers' Forum) ... 214
WANG, CHI-TEH, F. K. TEICHMANN, AND GEORGE GERARD. Buckling of Sandwich Cylinders Under Axial Compression ... 398

WATTENDORF, FRANK L. Simplified Design Comparisons of Axial Compressors 447
WEGENER, PETER P. Summary of Recent Experimental Investigations in the N.O.L. Hyperballistics Wind Tunnel 665
WEIL, HERSCHEL. Effects of Pressure Gradient on Stability and Skin Friction in Laminar Boundary Layers in Compressible Fluids 311
WEISS, HERBERT K. Analysis of a Friction Damper for Clutch-Type Servomechanisms 676
WHIPPLE, F. L., AND R. N. THOMAS. Astroballistic Heat Transfer (Readers' Forum) 636
WHITE, DONALD R. Reflection of Strong Shock at Nearly Glancing Incidence (Readers' Forum) 633
WILLIAMS, E. L., AND B. E. GATEWOOD. Allowable Compressive Stresses in Aircraft Structures 657
WILTS, C. H., R. H. MACNEAL, AND G. D. MCCANN. Discussion on "The Solution of Elastic Problems by Electronic Analog Computation" (Readers' Forum) 71
——————————— The Solution of Aeroelastic Problems by Means of Electrical Analogies .. 777
Wind Tunnels—
Design and Performance of a Simple Interferometer for Wind-Tunnel Measurements, Harry I. Ashkenas and Arthur E. Bryson 82
A Flexible Nozzle for a Small Supersonic Wind Tunnel, Satish Dhawan and Anatol Roshko 253
High-Efficiency Supersonic Diffusers, E. P. Neumann and F. Lustwerk 369
Readers' Forum
A Method of Correction of Astigmatism in Schlieren Systems, Rochelle Prescott and E. L. Gayhart 69
A Note on Wind-Tunnel Wall Effect Corrections for Rectangular Airfoils, K. G. Merriam 845
Secondary Flow in Cascades, J. M. Stephenson 699
Visualization of Boundary-Layer Flow, James S. Murphy and Ralph E. Phinney 771
The Secondary Flow in a Cascade of Airfoils in a Nonuniform Stream, H. B. Squire and K. G. Winter 271
A Shock Tube Method of Generating Hypersonic Flows, Abraham Hertzberg 803
Summary of Recent Experimental Investigations in the N.O.L. Hyperballistics Wind Tunnel, Peter P. Wegener. 665
Wing, rectangular, in supersonic flow, purely rolling oscillations of 191
Wing, swept, coupled free vibrations of 329
Wing, sweptback, structural studies, some results of 705
Wing, wedge-shaped, calculation of thermal stresses in 115
Wings and bodies at $M = 6.9$, exploratory wind-tunnel investigation of 641
Wings, cruciform delta, at supersonic speeds, some roll characteristics of 289
Wings, diamond-shaped supersonic, the effect of flight and configuration variables on thermal stresses in 755
Wings, low aspect ratio, at subsonic speeds, the lift distribution on 683
Wings, supersonic, having biconvex sections, the characteristics of 7
Wings, supersonic, methods for calculating the flow in the Trefftz-plane behind 179
Wings, supersonic rectangular, striking a sharp-edged gust, aerodynamics of 519
Wings, swept, a superposition method for calculating the aeroelastic behavior of 531
Wings, sweptback, an approximate method for the calculation of the stresses in 61
Wings, thin, in frictionless flow, the minimum drag of 75
Wings, uniformly loaded, in subsonic flow, conical flow methods applied to 107
WINTER, K. G., AND H. B. SQUIRE. The Secondary Flow in a Cascade of Airfoils in a Nonuniform Stream 271
WOERSCHING, THOMAS B. Negative Camber Airfoils for Transonic Flight 361
WOLANSKY, JOHN, AND ARTHUR N. TIFFORD. On the Calculation of the Rate of Heat Transfer Through a Laminar Boundary Layer (Readers' Forum) 427
YALE, G. E., AND W. S. BRADFIELD. Small Pitot Tubes with Fast Pressure Response Time (Readers' Forum) ... 697
YOUNG, GEORGE B. W., CHARLES SISKA, AND MILTON D. VAN DYKE. Proper Use of the M.I.T. Tables for Supersonic Flow Past Inclined Cones (Readers' Forum). 355

191
329
705
115
641
289
755
683
7
179
519
531
61
75
107
271
361
427
697
355